No. 825,380. PATENTED JULY 10, 1906.

J. M. COALE, DEC'D.

F. W. & M. L. COALE, EXECUTORS.

SAFETY VALVE.

APPLICATION FILED OCT. 5, 1904.

Fig. 1

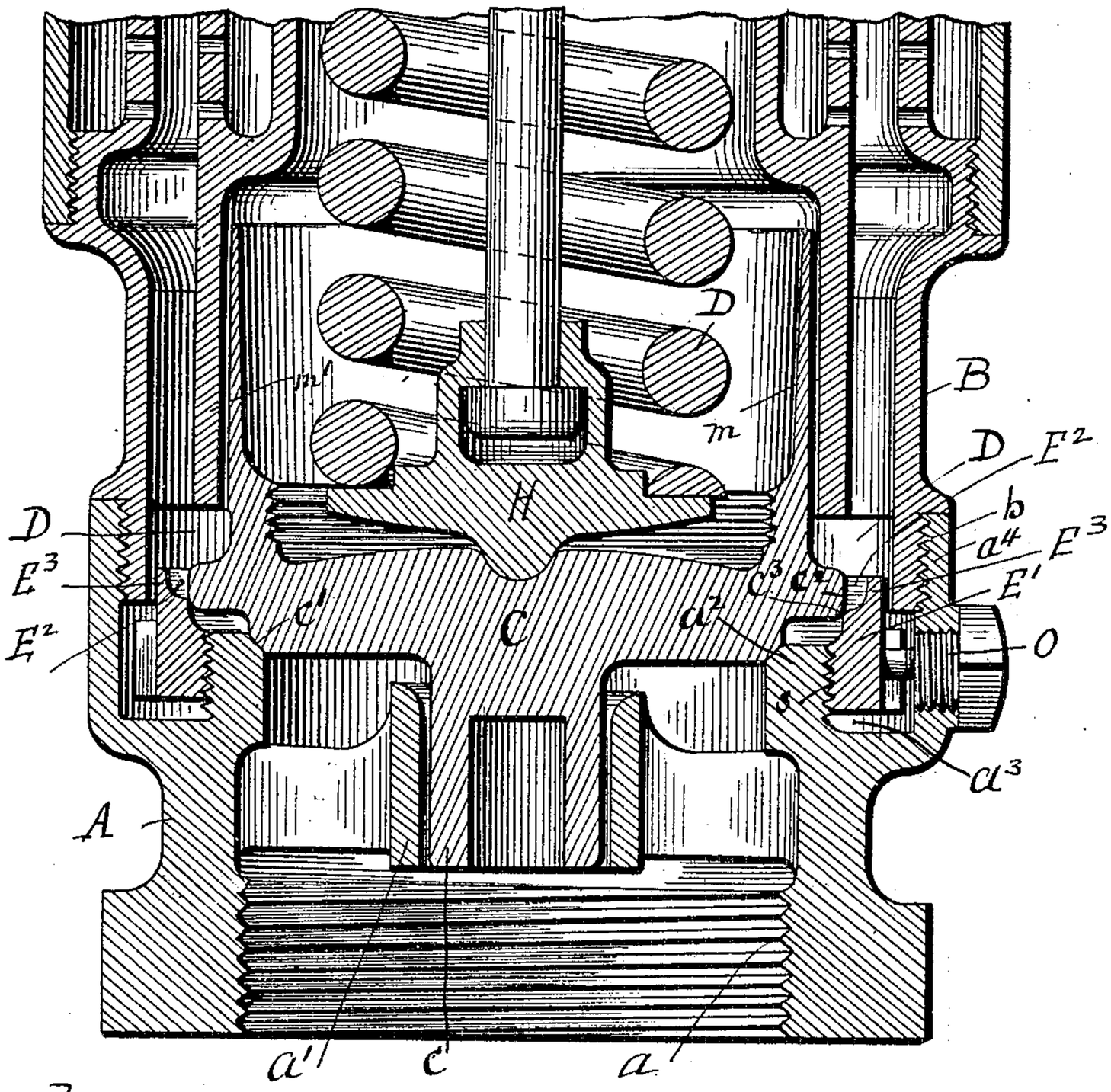


Fig. 3

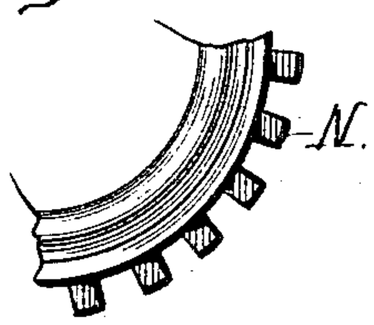
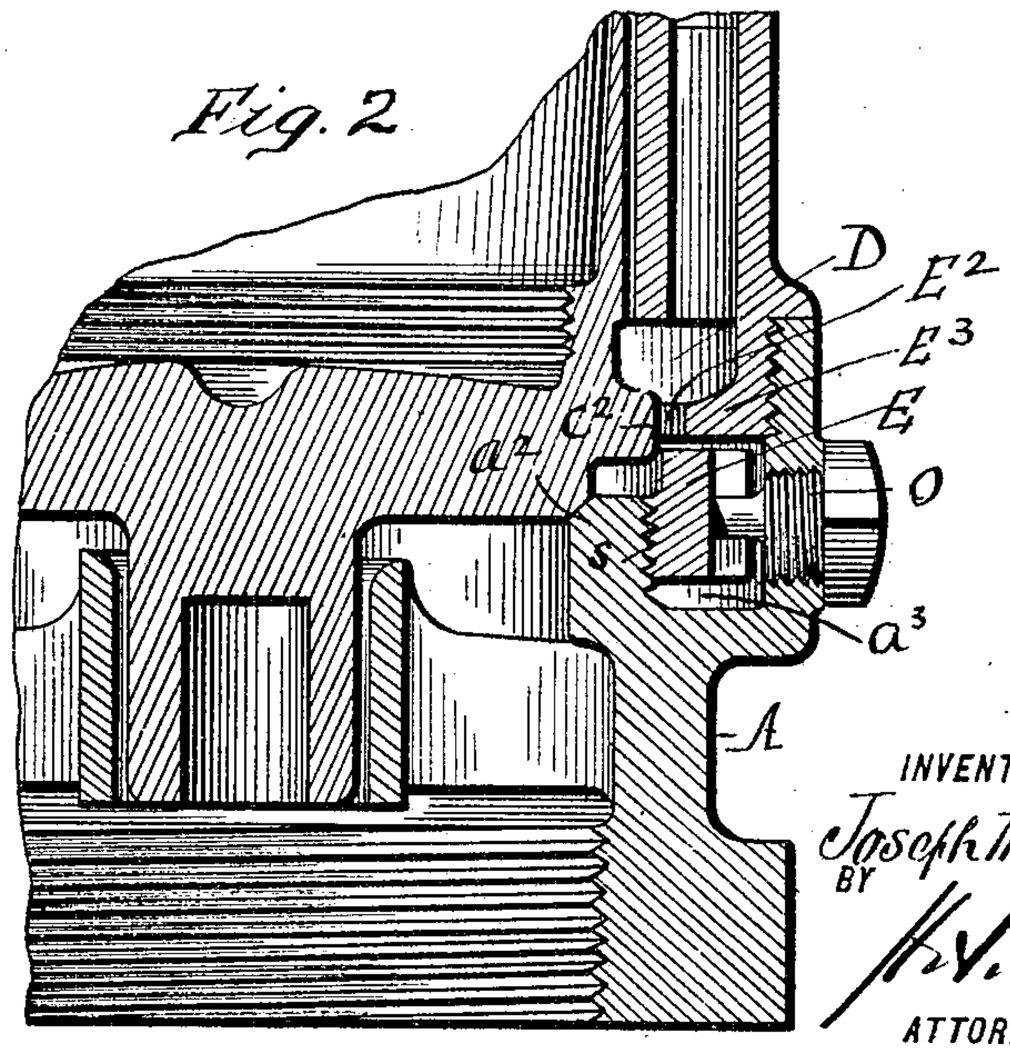


Fig. 2



WITNESSES:

F. J. Hartman.

A. M. Biddle.

INVENTOR

Joseph M. Coale

BY

H. V. Haldeman

ATTORNEY.

UNITED STATES PATENT OFFICE.

JOSEPH M. COALE, OF BALTIMORE, MARYLAND; FRANK W. COALE AND MARY L. COALE, EXECUTORS OF SAID JOSEPH M. COALE, DECEASED, ASSIGNORS TO COALE MUFFLER AND SAFETY VALVE CO., OF BALTIMORE, MARYLAND, A CORPORATION OF NEW JERSEY.

SAFETY-VALVE.

No. 825,380. Specification of Letters Patent. Patented July 10, 1906.

Application filed October 5, 1904. Serial No. 227,268.

To all whom it may concern:

Be it known that I, JOSEPH M. COALE, a citizen of the United States, residing in the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Safety-Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to safety-valves of the class known as "pop-valves," which comprise a huddling-chamber beyond the initial valve-seat and an adjusting-ring for regulating the size of the strictured orifice from the huddling-chamber. Such a safety-valve is described in Letters Patent of the United States granted to me, No. 459,104, dated September 8, 1891, and No. 657,086, dated September 4, 1900. The adjusting-ring referred to operates, as is well known, to vary the size of the annular strictured orifice, and thereby regulate the amount of pressure that the valve will blow down; but it has been observed that in such valves there is an excess of steam-pressure blown off beyond that necessary to compress the spring and lift the valve, which excess is suddenly lost when the valve is lifted. Hence the valve drops back slightly. This is due to the fact that the pressure in the huddling-chamber is greater than that at which the valve was lifted from its seat and that the huddling-chamber opens directly into a large discharge-chamber. Hence a part of this pressure is suddenly lost, and the valve rebounds backward to some extent. This is a defect in the operation of such valves which precludes the provision of a sensitively-operating valve which will respond to and hold the valve open under slight increase of pressure above that at which it is set to open and without lifting it more than enough to discharge the excess of pressure required.

My invention has for its object to remedy the defect referred to; and it consists of means to provide an intermediate annular throat or passage-way between the discharge-annulus of the pop-chamber and the larger discharge-chamber of the valve.

In the drawings illustrating my invention, Figure 1 is a vertical diametrical section of the lower portion of a muffled safety-valve embodying my improvement. Fig. 2 is a like view of a modified form of the device, and Fig. 3 a plan view of a segment of the adjusting-ring applicable to the device of both views.

The old portion of the valve illustrated in the drawings may be briefly described as follows: A is the lower section of the valve-casing. It is screw-threaded at a to attach it to steam-piping, and it is provided, as usual, with the guide a' for the valve-stem c, the annular beveled or countersunk valve-seat a^2, the annular well a^3, concentric with said seat, and the screw-threaded tubular part a^4 for the reception of the screw-threaded neck b of the upper section B of the valve-casing. The valve C has a central depending stem c, adapted to operatively fit the guide a', and has an annular beveled face c' to fit the beveled valve-seat a^2 and a projecting flange c^2, slightly undercut and having a beveled edge c^3, forming the top and inner side of the huddling or pop chamber. The valve is held to its seat by a spring d, as usual, resting on a disk H, supported on the upper face of the valve C, and has a long annular flange m, which operates to guide the valve in its rise and fall relatively to the inner wall m' of the upper or spring casing B.

I will now describe the new elements.

The outer wall of the pop-chamber is formed by the adjusting-ring E in Fig. 2 and by the lower part of the flanged ring E′ in Fig. 1. The ring in both cases is adjustable vertically in the well a^3 in the lower casing A by means of an annular rack N (shown in Fig. 3) or otherwise, actuated by a pinion on the short shaft of the screw O, projecting through the wall of the valve-case and engaging with gear-teeth on the rack. The inner face of the adjusting-ring E E′ is screw-threaded at s to engage with coinciding threads on the lower valve-casing.

In the devices of my said prior patents, as in all other pop-valves of which I have knowledge, the huddling-chamber, (in which the steam after lifting the valve from its seat) acquires and imparts an additional force which gives a second lift to the valve. The steam is discharged through the strictured annular opening of the huddling-chamber into a comparatively large chamber, (indicated at D, Figs. 1 and 2.) The only useful

function of the huddling-chamber is to hold the valve open for a while after it has been lifted from its seat; but the effect of huddling the steam therein is to increase its lifting force much above that at which it lifted the valve from its seat a^2, thus throwing it up somewhat higher than is necessary, and this excess of force beyond what is necessary to merely hold the valve open is suddenly lost by a direct discharge of the steam from the strictured pop-chamber into a comparatively large chamber. Hence a portion of the pressure beyond what is intended to be blown off will be lost, its sensitiveness diminished, indicated by the fact that the valve will slightly rebound backward. I have discovered that this defect can be remedied by interposing between the strictured orifice of the pop-chamber and the aforesaid comparatively large discharge-chamber an intermediate annular throat or passage-way, (indicated at E^2,) which will prevent a sudden drop of the pressure and the consequent backward rebound of the valve. Such intermediate annular throat at each end thereof should be much smaller in area than the base of the discharge-chamber into which it opens and larger in a lesser proportion than any variable area of the annular strictured orifice of the huddling-chamber. In the drawings, these elements are drawn to a scale, from valves made and operated by me, and are to be taken as examples of the correct proportions. Slight variations, however, would not be material provided the described relation of the areas is maintained. Means to provide such intermediate annular throat or passage is shown in the drawings and consists of a projection E^3, extending into the lower part of the discharge-chamber D directly above the huddling-chamber, the back of which projection E^3 is coincident with the wall of the upper or spring casing B and the inner face of which forms one wall of the aforesaid throat or passage E^2, the opposite wall thereof being formed by the projection c^2 of the valve. In Fig. 1 this projection E^3 is formed on top of and integral with the adjusting-ring E, while in Fig. 2 it is made separate from the ring and forms an integral part of the upper or spring casing B. In both it is the same identical projection forming one wall of the intremediate throat and in the same operative relation to the adjusting-ring, huddling-chamber, its annular strictured orifice, and the comparatively large discharge-chamber. The structure shown in Fig. 1 has two advantages over that shown in the other figure, namely: it is cheaper to make the projection a part of the adjustable ring, and, moreover, when so made it is vertically adjustable in unison with the adjustment of the ring itself, which governs the size of the annular orifice from the huddling-chamber. Hence I prefer the latter form of the device. The result in the operation of the device is that the valve is far more sensitive than before, there is no excess of pressure in the pop-chamber beyond that necessary to hold the valve open after its initial lift from the valve-seat, and consequently no backing rebound of the valve, and the valve will be found to close promptly when the excess of pressure over that it is set to open has been blown off.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a safety-valve of the class described, containing a huddling-chamber with a strictured annular orifice, formed between the exterior wall of the valve and the interior wall of an adjusting-ring, of means to provide a restricted annular throat or passage-way between the annular orifice of the huddling-chamber and the relatively large discharge-chamber within the casing.

2. In a safety-valve of the class described, the combination with the valve and the valve-casing and with the adjusting-ring forming the outer wall of the huddling-chamber, of an upwardly and outwardly extending projection formed integral with said ring, arranged relatively to the valve-wall to form a restricted annular throat or passage-way between the huddling-chamber and the relatively large discharge-chamber.

In testimony whereof I have hereunto affixed my signature this 24th day of September, A. D. 1904.

JOSEPH M. COALE

Witnesses:

WILLIAM M. MALOY,

GEO. M. BRADY.